US-PAT-NO: 6624098

DOCUMENT-IDENTIFIER: US 6624098 B1

TITLE: Sailcloth having improved stability

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Brief Summary Text - BSTX (5):

In the weaving process, the yarns pass over and under each other in a repeating pattern, which induces a certain amount of crimp in the yarn. Woven sailcloth cannot be made entirely from aramid yarns because the crimp reduces the desired stretch properties of the fabric and friction between yarns causes early failure. Thus, aramid and other cloths comprising low stretch yarns are made from low stretch yarns running in one direction and polyester yarns running in the other direction. Thus, the fabric is relatively weak in one direction, and the sailmaker designs sails in which the panels are arranged such that the strong yarns run in the direction of maximum **load lines** in the sail.

US-PAT-NO: 6332420

DOCUMENT-IDENTIFIER: US 6332420 B1

TITLE: Sail of one piece three dimensional fabric

---------- KWIC ---------

Brief Summary Text - BSTX (1):

In the Baudet U.S. Pat. No. 5,097,784, a method is described for making a sail on mold having an adjustable profile or 3-D surface. A triangular sail is made by first applying a layer of film on the mold, applying individual adhesively coated yarns on the film with yarns extending from corner to corner in generally a curved path, and then applying a top layer of film. The film layers carry adhesive and are bonded together on the mold using heat and pressure. The resulting product is a three-dimensional, one-piece laminate having yarns which run along **stress lines** in the sail, generally in a curved fashion.

FAST Browser - L9: (14) 5 and 8 and 3 | US 6332420 B1 | Tag: S_T1 | Doc: 2/14 | Format: KWIC

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	Document ID	Title
1	US 6624098 B1	Sailcloth having improved sta
2	US 6332420 B1	Sail of one piece three dimens
3	US 6302044 B1	Multisection sail body and me
4	US 6112689 A	Sail body and method for mak

US-PAT-NO: 6332420

DOCUMENT-IDENTIFIER: US 6332420 B1

Viewer

Times New Roman 12

ensional fabric

--------- KWIC --------

Brief Summary Text - BSTX (1):

In the Bandet U.S. Pat. No. 5,097,784, a method is described for making a sail on mold having an adjustable profile or 3-D surface. A triangular sail is made by first applying a layer of film on the mold, applying individual adhesively coated yarns on the film with yarns extending from corner to corner in generally a curved path, and then applying a top layer of film. The film layers carry adhesive and are bonded together on the mold using heat and pressure. The resulting product is a three-dimensional, one-piece laminate having yarns which run along stress lines in the sail, generally in a curved fashion.

US006332420B1

(12) **United States Patent**
Rodgers

(10) **Patent No.: US 6,332,420 B1**
(45) **Date of Patent: Dec. 25, 2001**

(54) **SAIL OF ONE PIECE THREE DIMENSIONAL FABRIC**

(75) Inventor: John H. Rodgers, Carson City, NV (US)

(73) Assignee: North Marine Group, Milford, CT (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/598,871

(22) Filed: Jun. 21, 2000

(51) Int. Cl.[7] B63H 9/06

(52) U.S. Cl. 114/102.31

(58) Field of Search 114/102.31

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3,905,616 * 9/1975 Andersen 114/102.31
4,708,080 * 11/1987 Conrad 114/102.31
4,845,868 * 8/1989 Linville 114/102.31
5,097,784 * 3/1992 Bandet 114/102.31
6,260,497 * 7/2001 Kelrs 114/102.29

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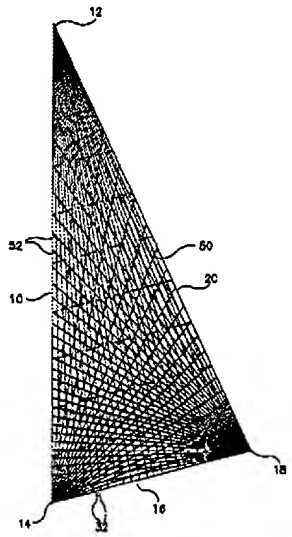
Primary Examiner—Sherman Basinger
(74) *Attorney, Agent, or Firm*—Pyle & Piontek

(57) **ABSTRACT**

A sail is formed on a mold in a three dimensional fashion. The sail is a laminate having three corners. The sail includes two outer layers of film and an inner yarn structure. Yarns radiate from each corner of the sail and terminate at an edge opposite the corner. Additional secondary reinforcing elements may be added between the film layers.

9 Claims, 10 Drawing Sheets



US-PAT-NO: 6302044

DOCUMENT-IDENTIFIER: US 6302044 B1

TITLE: Multisection sail body and method for making

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Abstract Text - ABTX (1):

A sail body (3), which can be finished along its edges and corners to create a finished sail (2), includes a number of sail sections(46) joined along their edges (47). Each sail section includes a reinforced material (20) laminated between first and second films (32,42). The reinforced material includes sectors of reinforced material (30,31), each sector having a set of generally parallel reinforcement elements (24), such as fibers. The sectors of reinforced material are preferably elongate sectors in which at least the majority of the sectors have lengths (34) at least five times as long their widths (36). The sectors are arranged in an overlapping pattern and so that the set of reinforcement elements are generally aligned with the expected **load lines** (28)for that section of the sail body. Sections can be made of different shapes but are typically triangular or quadrilateral. The reinforce material is typically a mesh or scrim containing sets of parallel, transversely oriented fibers (24,26). The mesh or scrim can either woven or unwoven.

Brief Summary Text - BSTX (8):

An approach to control sail-stretch has been to build a more traditional sail out of conventional woven fill-oriented sailcloth panels and to reinforce it externally by applying flat tapes on top of the panels following the anticipated **load lines**. See U.S. Pat. No. 4,593,639. While this approach is relatively inexpensive, it has its own drawbacks. The reinforcing tapes can shrink faster than the sailcloth between the tapes resulting in severe shape irregularities. The unsupported sailcloth between the tapes often bulges, affecting the design of the airfoil.

Brief Summary Text - BSTX (9):

A further approach has been to manufacture narrow cross-cut panels of sailcloth having individual laid-up yarns following the **load lines**. The

individual yarns are sandwiched between two films and are continuous within each panel. See U.S. Pat. No. 4,708,080 to Conrad. Because the individual radiating yarns are continuous within each panel, there is a fixed relationship between yarn trajectories and the yarn densities achieved. This makes it difficult to optimize yarn densities within each panel. Due to the limited width of the panels, the problem of having a large number of horizontal seams is inherent to this cross-cut approach. The narrow cross-cut panels of sailcloth made from individual spaced-apart radiating yarns are difficult to seam successfully; the stitching does not hold on the individual yarns. Even when the seams are secured together by adhesive to minimize the stitching, the proximity of horizontal seams to the highly loaded corners can be a source of seam, and thus sail, failure.

Brief Summary Text - BSTX (10):

A still further approach has been to manufacture simultaneously the sailcloth and the sail in one sector on a convex mold using uninterrupted load-bearing yarns laminated between two films, the yarns following the anticipated **load lines**. See U.S. Pat. No. 5,097,784 to Baudet. While providing very light and low-stretch sails, this method has its own technical and economic drawbacks. The uninterrupted nature of every yarn makes it difficult to optimize yarn densities, especially at the sail corners. Also, the specialized nature of the equipment needed for each individual sail makes this a somewhat capital-intensive and thus expensive way to manufacture sails.

Brief Summary Text - BSTX (17):

U.S. patent application Ser. No. 09/173,917 filed Oct. 16, 1998 and entitled Composite Products, Methods and Apparatus, describes a low stretch, flexible composite particularly useful for making high performance sails. The composite includes first and second polymer films with discontinuous, stretch resistant segments therebetween. The segments extend generally along the expected **load lines** for the sail. The segments have lengths which are substantially shorter than the corresponding lengths of the **load lines** within each sail section. The sail can be either two-dimensional or three dimensional. The two-dimensional sails can be made from one section or a number of flat sections seamed together. Three dimensional sails can be made using one or more molded sections of the composite sheet or several flat sections can be broad seamed together to create the three dimensional sail. The sail can be designed to exhibit generally constant strain qualities under a desired use condition and to permit low stretch performance to be optimized by minimizing the crimp, that is the geometrical stretch, of the yarns.

Brief Summary Text - BSTX (20):

The sail body, which can be finished along its edges and corners to create a finished sail, includes a number of sail sections joined along their edges. Each sail section includes a reinforced material laminated between first and second films. The reinforced material includes sectors of reinforced material, each sector having a set of generally parallel reinforcement elements, such as fibers. The sectors are arranged in an overlapping pattern and so that the set of reinforcement elements are generally aligned with the expected **load lines** for that section of the sail body. The sectors of reinforced material are preferably elongate sectors in which at least the majority of the sectors have lengths at least three times as long as their widths. Sections can be made of different shapes but are typically triangular or quadrilateral. The reinforced material is typically a mesh or scrim containing sets of parallel, transversely oriented fibers. The mesh or scrim can be either woven or unwoven.

Brief Summary Text - BSTX (21):

According to another aspect of the invention, a sail body is made from a plurality of sail sections by arranging elongate sectors of reinforced material on a first film in an overlapping pattern, each sector having a set of generally parallel reinforcement elements, such as fibers. The sectors of reinforced material are preferably elongate sectors in which at least the majority of the sectors have lengths which are at least three times as long as their widths. The arranged sectors of reinforced material are laminated between first and second films to form a sail section. The sectors are preferably arranged so that the set of generally parallel reinforcement elements are generally aligned with the expected **load lines** for that sail section of the sail body. The reinforced material is preferably a prepreg material, that is a material that is impregnated with an uncured adhesive. The arranging step may be carried out using, for example, triangular or quadrilateral sectors of the material. The sail sections are typically joined by broad seaming the sail sections to one another along their adjacent edges.

Drawing Description Text - DRTX (2):

FIG. 1 is a plan view of a sail made according to the present invention with an exemplary set of expected **load lines** shown in dashed lines;

Detailed Description Text - DETX (4):

FIG. 2 illustrates a roll of adhesive-impregnated, uncured reinforced material 20, also called a prepreg or a prepreg material. Material 20 is

typically made of an uncured adhesive such as a copolyester resin, and a mesh or scrim 22 of fibers or other reinforcement elements. The mesh or scrim 22 will typically be unwoven but may be woven for increased tear resistance. Mesh or scrim 22 preferably includes a set of first reinforcement elements 24 which run parallel to one another along the length of material 20 and a set of second, generally parallel reinforcement elements 26 which are arranged transversely to, typically perpendicular to, reinforcement elements 28. Reinforcement elements 24, 26 can be made from a variety of materials such as monofilament material, multifiber yarns made of, for example, carbon fiber, aramid fiber, polyester fiber or fiber sold under the trademarks PBO.RTM., Pentex.RTM. or Spectra.RTM.. Reinforcement elements may be, for example, cylindrical or flattened in cross-section and may be made of twisted or untwisted fibers. Reinforcement elements 24 are typically, but need not be, the fibers used to be generally aligned with the expected **load lines** 28 of sail 2.

Detailed Description Text - DETX (6):

Material 20 is cut into sectors 30, 31 of prepreg material 20 of various shapes and sizes, but typically triangular and quadrilateral, as suggested in FIG. 2. FIG. 3 illustrates arranging triangular sectors 30 with their edges slightly overlapping on to a first, imperforate film 32, film 32 typically made of PET, polyester film or other materials such as Kapton.RTM. polyimide film made by Dupont. Each sector 30, 31 has a length 34 and a width 36, the average length being substantially, typically at least about three to ten times, and more preferably at least about five times, the average width. First, longitudinally-extending reinforcement elements 24 are typically parallel to length 34. Pieces 30, 31 are sized, cut and arranged so that reinforcement elements, typically first reinforcement elements 24, will generally parallel expected **load lines** 28 when sail 2 is assembled. FIG. 4 illustrates a double layer of triangular sectors 30 with the upper layer 38 not extending over the same surface area as the lower layer 40. FIG. 5 illustrates overlapping of quadrilateral sectors 31 with the most extensive overlapping taking place at the lower left corner 41 to correspond to the concentration of expected **load lines** 28 at that region. When making multiple-layer sections, the sectors may be butt-joined together within each layer to help create a smoother finished product. Of course other arrangements, sizes and shapes of sectors could also be used.

Detailed Description Text - DETX (7):

FIG. 6 illustrates capturing sectors 30 between first film 32 and a second film 42. Pieces 30, 31 of reinforced material 20, first film 32 and second

film 42 may be laminated in any of a variety of conventional or unconventional fashions. If desired, additional adhesives may be used between films 32, 42. Also, reinforced material 20 may be made without any adhesive so that all the adhesive is applied as a separate step prior to lamination. After lamination, the combination of sectors 30,31, films 32, 42 and the adhesive bonding the layers constitute an uncut sail section 44, typically generally rectangular in shape. Uncut sail section 44 is then cut to the appropriate shape to create a sail section 46 as shown in FIG. 7. Sail body 3, in this embodiment, is made by assembling, typically broad seaming, four different sail sections 46 together along their adjacent edges 47, 47A, 47B, 47C. In addition to triangular sail section 46, sail 2 is also made from three different quadrilateral sail sections 46A, 46B and 46C. By comparing expected **load lines** on sail 1 with the suggested orientations of the reinforcement elements 24, 26, in particular the longitudinally-extending the reinforcement elements 24, it is seen that the reinforcement elements are generally aligned with the expected **load lines**.

Claims Text - CLTX (1):
1. A sail body, of the type having expected **load lines,** comprising:

Claims Text - CLTX (5):
the first set of reinforcement elements of said first and second sectors are generally aligned with the respective expected **load lines** passing through said first and second sectors.

Claims Text - CLTX (12):
8. A method for making a sail body from a plurality of sail sections, each sail section having expected **load lines,** comprising:

Claims Text - CLTX (17):
the first set of the reinforcement elements of said first and second sectors are generally aligned with the respective expected **load lines** passing through said first and second sectors; and

Claims Text - CLTX (27):
15. A method for making a sail body from a plurality of sail sections, each sail section having expected **load lines,** comprising:

Claims Text - CLTX (32):

the first set of the reinforcement elements of said first and second sectors are generally aligned with the respective expected **load lines** passing through said first and second sectors, said elongate sectors being impregnated with an adhesive; and

US-PAT-NO: 6112689

DOCUMENT-IDENTIFIER: US 6112689 A

TITLE: Sail body and method for making

---------- KWIC ---------

Abstract Text - ABTX (1):

A sail body (3) includes first and second skin layers (40, 42), each skin layer having an outer film (22) at an outer side (34) and reinforcement elements (28, 30) at an inner side (36). The skin layers are laminated with the inner sides abutting to form the sail body. The skin layers are each made up of skin components (38) joined to other skin components of the same skin layer another along their aligned edges (43). The joined edges (44) of the first skin layer are offset from the joined edges of the second skin layer to strengthen the sail body. The sail body is preferably a three-dimensional molded sail body. The fibers or other reinforcement elements are preferable generally aligned with the expected **load lines** (32) of the sail body.

Brief Summary Text - BSTX (8):

An approach to control sail-stretch has been to build a more traditional sail out of conventional woven fill-oriented sailcloth panels and to reinforce it externally by applying flat tapes on top of the panels following the anticipated **load lines**. See U.S. Pat. No. 4,593,639. While this approach is relatively inexpensive, it has its own drawbacks. The reinforcing tapes can shrink faster than the sailcloth between the tapes resulting in severe shape irregularities. The unsupported sailcloth between the tapes often bulges, affecting the design of the airfoil.

Brief Summary Text - BSTX (9):

A further approach has been to manufacture narrow cross-cut panels of sailcloth having individual laid-up yarns following the **load lines**. The individual yarns are sandwiched between two films and are continuous within each panel. See U.S. Pat. No. 4,708,080 to Conrad. Because the individual radiating yarns are continuous within each panel, there is a fixed relationship between yarn trajectories and the yarn densities achieved. This makes it

difficult to optimize yarn densities within each panel. Due to the limited width of the panels, the problem of having a large number of horizontal seams is inherent to this cross-cut approach. The narrow cross-cut panels of sailcloth made from individual spaced-apart radiating yarns are difficult to seam successfully; the stitching does not hold on the individual yarns. Even when the seams are secured together by adhesive to minimize the stitching, the proximity of horizontal seams to the highly loaded corners can be a source of seam, and thus sail, failure.

Brief Summary Text - BSTX (10):

A still further approach has been to manufacture simultaneously the sailcloth and the sail in one piece on a convex mold using uninterrupted load-bearing yarns laminated between two films, the yarns following the anticipated **load lines**. See U.S. Pat. No. 5,097,784 to Baudet. While providing very light and low-stretch sails, this method has its own technical and economic drawbacks. The uninterrupted nature of every yarn makes it difficult to optimize yarn densities, especially at the sail corners. Also, the specialized nature of the equipment needed for each individual sail makes this a somewhat capital-intensive and thus expensive way to manufacture sails.

Brief Summary Text - BSTX (17):

U.S. patebt application Ser. No. 09/173,917 filed Oct. 16, 1998 and entitled Composite Products, Methods and Apparatus, describes a low stretch, flexible composite particularly useful for making high performance sails. The composite includes first and second polymer films with discontinuous, stretch resistant segments therebetween. The segments extend generally along the expected **load lines** for the sail. The segments have lengths which are substantially shorter than the corresponding lengths of the **load lines** within each sail section. The sail can be either two-dimensional or three dimensional. The two-dimensional sails can be made from one section or a number of flat sections seamed together. Three dimensional sails can be made using one or more molded sections of the composite sheet or several flat sections can be broad seamed together to create the three dimensional sail. The sail can be designed to exhibit generally constant strain qualities under a desired use condition and to permit low stretch performance to be optimized by minimizing the crimp, that is the geometrical stretch, of the yarns.

Brief Summary Text - BSTX (21):

The sail body may be a two-dimensional or a three-dimensional sail body. The fibers or other reinforcement elements are preferable generally aligned

with the expected **load lines of the sail body**.

Drawing Description Text - DRTX (2):

FIG. 1 is a plan view of a sail made according to the present invention with an exemplary set of expected **load lines** shown in dashed lines;

Detailed Description Text - DETX (3):

FIG. 2 illustrates making an uncured reinforced film 20 from an imperforate film 22, typically made of PET or polyester film, an uncured adhesive web 24, such as a copolyester resin, or and a mesh or scrim of fibers or other reinforcement elements 26. Film 22 could be made from other materials, such as Kapton.RTM. polyimide film made by DuPont. The mesh or scrim will typically be unwoven but may be woven for increased tear resistance. Mesh or scrim 26 preferably includes a set of first reinforcement elements 28 which run parallel to one another along the length of film 20 and a set of second, generally parallel reinforcement elements 30 which are arranged transversely to, typically perpendicular to, reinforcement elements 28. Reinforcement elements 28, 30 can be made from a variety of materials such as monofilament material, multifiber yarns made of, for example, carbon fiber, aramid fiber, polyester fiber or fiber sold under the trademarks PBO.RTM., Pentex.RTM. or Spectra.RTM.. Reinforcement elements may be, for example, cylindrical or flattened in cross-section and may be made of twisted or untwisted fibers. Reinforcement elements 28 are typically, but need not be, the fibers used to be generally aligned with the expected **load lines** 32 of sail 2.

Claims Text - CLTX (10):

7. The sail body according to claim 1 wherein said sail body has expected **load lines** and said first set of generally parallel reinforcement elements are generally aligned with said expected **load lines**.

Claims Text - CLTX (20):

said sail body having expected **load lines,** said first set of generally parallel reinforcement elements being generally aligned with said expected **load lines**; and

Claims Text - CLTX (37):

20. The method according to claim 19 further comprising determining a set of expected **load lines for the sail body** and generally aligning the first

reinforcement elements with the expected **load lines**.

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	Document ID	Title
3	US 6302044 B1	Multisection sail body and me
4	US 6112689 A	Sail body and method for mak
5	US 5470632 A	Composite material for fabric
6	US 5403641 A	Reinforced sailcloth

US-PAT-NO: 6112689

DOCUMENT-IDENTIFIER: US 6112689 A

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making

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Abstract Text - ABTX (1):

A sail body (3) includes first and second skin layers (40, 42), each skin layer having an outer film (22) at an outer side (34) and reinforcement elements (28, 30) at an inner side (36). The skin layers are laminated with the inner sides abutting to form the sail body. The skin layers are each made up of skin components (38) joined to other skin components of the same skin layer another along their aligned edges (43). The joined edges (44) of the first skin layer are offset from the joined edges of the second skin layer to strengthen the sail body. The sail body is preferably a three-dimensional molded sail body. The fibers or other reinforcement elements are preferable generally aligned with the expected load lines (32) of the sail body.

Brief Summary Text - BSTX (8):

An approach to control sail-stretch has been to build a more traditional sail out of conventional woven fill-oriented sailcloth panels and to reinforce it externally by applying flat tapes on top of the panels following the anticipated load lines. See U.S. Pat. No. 4,593,639. While this approach is relatively inexpensive, it has its own drawbacks. The reinforcing tapes can shrink faster than the sailcloth between the tapes resulting in severe shape irregularities. The unsupported sailcloth between the tapes often bulges, affecting the design of the airfoil.

Brief Summary Text - BSTX (9):

A further approach has been to manufacture narrow cross-cut panels of

US006112689A

United States Patent [19]

Baudet

[11] Patent Number: **6,112,689**

[45] Date of Patent: **Sep. 5, 2000**

[54] SAIL BODY AND METHOD FOR MAKING

[75] Inventor: Jean-Pierre Baudet, Emeryville, Calif.

[73] Assignee: Clear Image Concepts LLC, Alameda, Calif.

[21] Appl. No.: 09/346,276

[22] Filed: Jun. 25, 1999

[51] Int. Cl.[7] B63H 9/04

[52] U.S. Cl. 114/102.33; 114/102.31

[58] Field of Search 114/102.1, 102.29, 114/102.31, 102.33; 428/110, 111

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Catalog No. 5, Tools and Hardware for Manufacturing Composite Parts and Laminates of All Types, Torr Technologies, Inc., Auburn, Washington.

Primary Examiner—Mark T. Le

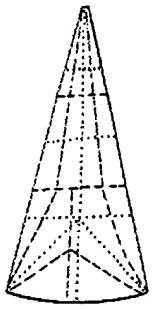
Assistant Examiner—Patrick Craig Muldoon

Attorney, Agent, or Firm—Townsend and Townsend and Crew LLP

[57] ABSTRACT

A sail body (3) includes first and second skin layers (40, 42), each skin layer having an outer film (22) at an outer side (34) and reinforcement elements (28, 30) at an inner side (36). The skin layers are laminated with the inner sides abutting to form the sail body. The skin layers are each made up of skin components (38) joined to other skin components of the same skin layer another along their aligned edges (43). The joined edges (44) of the first skin layer are offset from the joined edges of the second skin layer to strengthen the sail body. The sail body is preferably a three-dimensional molded sail body. The fibers or other reinforcement elements are preferable generally aligned with the expected load lines (32) of the sail body.

22 Claims, 4 Drawing Sheets



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	Document ID	Title
3	US 6302044 B1	Multisection sail body and me
4	US 6112689 A	Sail body and method for mak
5	US 5470632 A	Composite material for fabric
6	US 5403641 A	Reinforced sailcloth

US-PAT-NO: 5470632

DOCUMENT-IDENTIFIER: US 5470632 A

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Times New Roman 12

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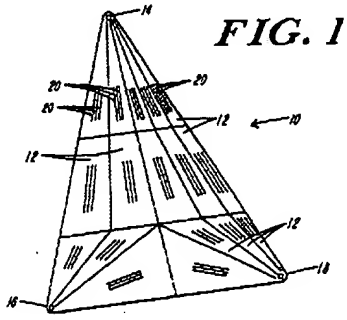
Detailed Description Text - DETX (2):

Referring now to FIG. 1 a typical sail 10 is provided with a number of panels 12 arranged between the head 14 and either the tack 16 or the clew 18 of the sail. Each of these panels is typically designed such that the major direction of strength of each panel is along the major stress lines, here indicated by referenced character 20. The purpose of using many panels in a sail is to take advantage of the particular directional properties of the sail material to accommodate the various forces occasioned by the wind loading of the sail. A large number of panels is necessary because, prior to the Subject Invention, the shear strength for common laminates was not sufficient to enable the fabrication of the sail with a single panel or with a reduced number of panels. It will be appreciated that the larger the number of panels the more weight overhead is generated by the added stitching that is required.

FIG. 1



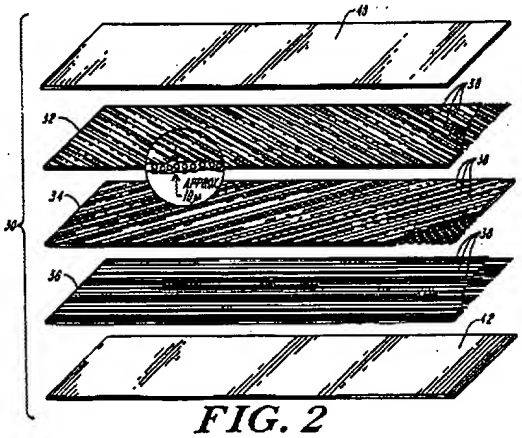


FIG. 2

US-PAT-NO: 5470632

DOCUMENT-IDENTIFIER: US 5470632 A

TITLE: Composite material for fabrication of sails and other articles

---------- KWIC ---------

Detailed Description Text - DETX (2):

Referring now to FIG. 1 a typical sail 10 is provided with a number of panels 12 arranged between the head 14 and either the tack 16 or the clew 18 of the sail. Each of these panels is typically designed such that the major direction of strength of each panel is along the major **stress lines,** here indicated by referenced character 20. The purpose of using many panels in a sail is to take advantage of the particular directional properties of the sail material to accommodate the various forces occasioned by the wind loading of the sail. A large number of panels is necessary because, prior to the Subject Invention, the shear strength for common laminates was not sufficient to enable the fabrication of the sail with a single panel or with a reduced number of panels. It will be appreciated that the larger the number of panels the more weight overhead is generated by the added stitching that is required.

US-PAT-NO: 5403641

DOCUMENT-IDENTIFIER: US 5403641 A

TITLE: Reinforced sailcloth

---------- KWIC ---------

Brief Summary Text - BSTX (11):

Conrad U.S. Pat. No. 4,708,080 shows a sail fabricated from a plurality of individual panels, each of which is fabricated from a laminate having at least two layers of material such as Mylar.RTM. film between which are disposed non-woven, force-bearing threads of Kevlar.RTM. and like stretch resistant polymeric material, which threads are aligned along the principal **stress lines** to which the particular panel will be subjected when installed in the sail and subjected to the force of the wind.

US-PAT-NO: 5355820

DOCUMENT-IDENTIFIER: US 5355820 A

TITLE: Machines for making laminate suitable for stress bearing materials such as sails

---------- KWIC ---------

Brief Summary Text - BSTX (11):

Now that warp-weft direction of cloth and panel orientations are no longer a concern, the benefits of panel construction have changed accordingly. Rather than using panel layouts to align the warp threads with the **load lines,** the panel selection and layouts are now used as a method for optimizing the manufacturing of a sail appropriate for mass production, as well as a method for accurate laying of structural members in a sail, i.e., the primary and secondary structural members. Moreover, multiple laminates are also possible with the lamination schedule also adding to the necessary product enhancements.

FAST Browser - 19 (14) 5 and 8 and 3 | US 5161479 A | Tag: S | Doc: 9/14 | Format: KWIC

File Edit View Tools Window Help

	Document ID	Title
7	US 5355820 A	Machines for making laminate
8	US 5333568 A	Material for the fabrication of
9	US 5161479 A	Laminated sail fabric
10	US 5097783 A	Reinforced sailcloth

US-PAT-NO: 5161479

DOCUMENT-IDENTIFIER: US 5161479 A

Viewer

Times New Roman 12

---------- KWIC --------

Brief Summary Text - BSTX (7):

The resultant material is then cut into panels of the sail. The panels are cut and arranged such that the warp yarns are generally aligned with known major stress lines in the sail, with the warp yarns carrying the major loads.

Detailed Description Text - DETX (7):

The resulting laminate is then cut into panels to make sails or similar pliant articles having lifting surfaces. First, the lines of maximum expected stress in the sail are determined. These stress lines, for example, generally radiate from the corners of a triangular sail and extend along the leech or trailing edge of the sail, and along the foot. The regions and direction of maximum stress on a sail under sailing conditions are well known to those skilled in the are of sail manufacture. The sail panels are cut and arranged such that the warp yarns of the fabric run generally parallel with the lines of maximum stress when the panels are joined together to make the sail. As an example, radial or triangular panels may be used at the corners. As a result, the warp yarns of the fabric carry the major loads in the sail, and the liquid crystal polymer film carries secondary loads in the cross direction.

US005161479A

United States Patent [19]

Mahr

[11] Patent Number: 5,161,479

[45] Date of Patent: Nov. 10, 1992

[54] **LAMINATED SAIL FABRIC**

[75] Inventor: Peter Mahr, Weston, Conn.

[73] Assignee: North Sails Group, Inc., Milford, Conn.

[21] Appl. No.: 864,844

[22] Filed: Apr. 7, 1992

[51] Int. Cl.[5] B63H 9/06

[52] U.S. Cl. 114/103; 428/105; 428/110; 428/193; 428/257; 428/258; 428/259; 428/294; 428/408; 428/902

[58] Field of Search 428/257, 258, 259, 290, 428/193, 408, 105, 110, 114, 294, 902; 114/103

[56] References Cited

U.S. PATENT DOCUMENTS

4,444,822	4/1984	Doyle et al.	428/109
4,590,121	5/1986	Mahr	428/258
4,945,848	8/1990	Linville	114/103
5,061,553	10/1991	Oben	428/412
5,074,234	12/1991	Stanzel	114/103
5,097,783	3/1992	Linville	428/110
5,097,784	3/1992	Baader	114/103

Primary Examiner—James J. Bell

Attorney, Agent, or Firm—Testtner Pyle & Lloyd

[57] **ABSTRACT**

Liquid crystal polymer films are laminated to a textile substrate in a specific fashion to produce a fabric especially useful for sail panels.

9 Claims, No Drawings

US-PAT-NO: 5097783

DOCUMENT-IDENTIFIER: US 5097783 A

TITLE: Reinforced sailcloth

---------- KWIC ---------

Abstract Text - ABTX (1):

A composite sail (mainsail, jib, spinnaker) is provided which is fabricated from a series of panels each of whichis joined to an adjacent panel. The individual panels comprise laminates of two outer layers between which is an inner layer comprising a weft-free warp of strands of a stretch resistant polymer. One of the outer layers can itself be a laminate of at least two layers of material, one of which comprises a film and the other of which comprises non-woven, force-bearing thread material aligned along the principal **stress lines** experienced by the panel when incorporated in the sail. In a particular embodiment one outer layer is comprised of a plurality of individual segments joined together along abutting edges, each of the segments being formed from a reinforced sheet having a layer of weft-free warp of strands of a stretch resistant polymer. The individual segments in the panel may have differing strand denier density.

Brief Summary Text - BSTX (12):

Conrad U.S. Pat. No. 4,708,080 shows a sail fabricated from a plurality of individual panels, each of which is fabricated from a laminate having at least two layers of material such as Mylar film between which are disposed non-woven, force-bearing threads of Kevlar and like stretch resistant polymeric material, which threads are aligned along the principal **stress lines** to which the particular panel will be subjected when installed in the sail and subjected to the force of the wind.

Brief Summary Text - BSTX (13):

The present invention, which is an improvement of that of my '519 patent, is directed to a composite sail which has greatly enhanced stretch and tear resistance in the direction of the principal **stress lines** which may occur in a direction toward the foot of the sail, or in a direction along the foot of the

sail, or otherwise. The composite sails of the present invention are of particular value for use in racing yachts and provide highly efficient, light weight sails having significantly extended useful life compared with sails hitherto available.

Brief Summary Text - BSTX (17):

These objects, and other objects and advantages of the invention which will become apparent from the description which follows, are achieved by the sails of the invention and the methods by which they are fabricated. Thus, in its broadest aspect, the invention comprises a composite sail having a head, a tack and a clew, and comprised of a plurality of panels each of which is joined to an adjacent panel. Each of the panels comprises a laminate of (i) a first outer layer of material, (ii) a second outer layer which comprises at least one film layer having bonded thereto a plurality of strands of non-woven, force-bearing thread material disposed along the principal **stress lines** for the panel in the sail, and (iii) an inner layer disposed between said first and second outer layers and comprised of a weft-free warp of strands of a stretch resistant polymer. The strands of layer (iii) in each panel may be aligned in a direction toward the foot of the composite sail, or in a direction along the foot of the sail, or otherwise. The various layers in the laminate are bonded together by a synthetic adhesive resin.

Brief Summary Text - BSTX (18):

In a particular embodiment of the composite sails of the invention the individual panels therein are fabricated using a second outer layer which is comprised of a plurality of segments joined together along abutting edges to form the panel. Each of the segments is fabricated by cutting and like means from a reinforced sheet material comprising at least two co-extensive layers bonded together at their interfaces by a synthetic adhesive resin. One of the outer layers is a film of dimensionally stable synthetic polyester resins and the other outer layer is selected from the group consisting of a warp-knit fabric, a scrim fabric, taffeta, a film of dimensionally stable synthetic polyester resin and a layer of release paper, release film, or like material. In the event that said other outer layer is a release paper or like release material, this layer is removed prior to utilization of the joined segments as the second outer layer in the panels employed in the sails of the invention. The inner layer, or at least one of the inner layers if there are more than one, comprises a weft-free warp of strands of a stretch resistant polymer in which the strands are disposed substantially along the principal **stress lines** for the segment in the sail panel. The strand denier density may vary from segment to segment in an individual panel of the sail, the greater density

being present in those segments in the area which will be subject to the greater stresses. Thus the segment or segments in the end of the panel which is close or closest to the leech in a sail will, in general, have a greater strand denier density than the segment or segments in the end of the panel closest to the luff of the sail.

Detailed Description Text - DETX (4):

In the particular embodiment shown in FIG. 1 the five panels A-E are fabricated from a skin (22) fabricated from a film having high stretch resistance. Such films are well-known in the art. Illustrative thereof are the drawn, oriented polyester films such as that available under the trademark Mylar. Other films having high tensile modulus are those fabricated from polymers such as nylon, polypropylene and the like. Advantageously the film has a thickness of the order of about 0.25 mils to about 20 mils and preferably from about 0.5 to about 3 mils. Disposed on the skin (22) in each of panels A-E are a plurality of stress-bearing structural members (24). These members are aligned in the direction of the expected principal **stress lines** created when the assembled sail is exposed to the force of the wind. The members (24) are formed of multiple filament strands, ribbons or strips of a stretch resistant polymer, advantageously an aramid such as Kevlar. The members (24), either in the form of free strands or ribbons or in the form of tape comprising one or a plurality of strands adhered to a backing tape such as polyethylene film, are attached to the skin (24) by adhesive after being laid on the skin by hand in a predetermined pattern. A detailed description of the preparation of such panels, of which panels A-E are illustrative, is given in the aforesaid U.S. Pat. No. 4,624,205 the specification of which is hereby incorporated in its entirety. It is to be understood that panels I'-V' of the sail in FIG. 12 may be prepared in a similar manner.

Detailed Description Text - DETX (5):

The panels A-E, advantageously after joining together to form a single continuous panel as described hereafter, are then subjected to lamination in accordance with the invention. It is to be understood that panels I'-V' of FIG. 12 may be similarly joined to form a continuous panel. FIG. 2 shows, in an exploded view, the three layers of a typical laminate so prepared using, for example, panel D of FIG. 1 as one of the outer layers. Layer (26) is a dimensionally stable polymeric film such as an oriented polyester film of which Mylar is typical. Layer (26) has a thickness of the order of about 0.25 mils to about 20 mils and preferably of the order of about 0.5 to about 3 mils. The thickness of layer (26) may be, but is not required to be, the same as that of the skin (22) employed in panel D. The inner layer (28) of the laminate

comprises a warp of substantially parallel, spaced apart strands of a synthetic polymer, advantageously Kevlar or like aramides, oriented transverse to the structural members (24) in panel D. It is to be understood that the orientation of the strands of inner layer (28) with respect to the structural members (24) will depend both upon how panels are cut and assembled to form a sail, and upon the expected principal **stress lines** of the panel. Thus, by transverse is meant that the strands of inner layer (28) are nonparallel with structural members (24). Further, it is to be understood that not only panels A-C, but also panels I'-V' of FIG. 12 may be similarly prepared.

Claims Text - CLTX (3):

(ii) a second outer layer which is comprised of a plurality of individual segments joined together along abutting edges, each of said segments formed of reinforced material comprising at least one layer of a film of dimensionally stable resin, and at least one layer of strands of a stretch resistant polymer disposed substantially along the principal **stress lines** for said segment in said sail; and

FAST Browser - 19 (14) 5 and 8 out 3 | US 4831953 A | Tag_S | Doc: 12/14 | Format: KWIC

File Edit View Tools Window Help

	Document ID	Title
10	US 5097783 A	Reinforced sailcloth
11	US 4945848 A	Reinforced sailcloth
12	US 4831953 A	Structural sails
13	US 4708080 A	Composite thread line sails

US-PAT-NO: 4831953

DOCUMENT-IDENTIFIER: US 4831953 A

Viewer

Times New Roman 12

--------- KWIC ---------

Brief Summary Text - BSTX (11):

The forces or loads on a sail and its fabric are exerted in a complex manner. These loads may be described by various notations, e.g., as contour lines, or lines of equal forces or load cells exerted on the sail. It must be understood that load lines are approximations and are done for convenience because the force is substantially solely, in the typical prior art sail, transmitted by the pliant fabric. The force is transmitted in an uneven fashion on a sail which is a surface of complex compound curves. For this complex curve surface, it is important that the surface has the right shape, because the maximum lifting efficiency over long periods of time has been developed as an art merely by comparison to a previous sail or a sail with given performance characteristics.

United States Patent [19]

Conrad

[11] Patent Number: 4,831,953

[45] Date of Patent: * May 23, 1989

[54] **STRUCTURAL SAILS**

[75] Inventor: Peter G. Conrad, Old Lyme, Conn.

[73] Assignee: Soltzed Sailmakers, Inc., Old Saybrook, Conn.

[*] Notice: The portion of the term of this patent subsequent to Jun. 10, 2003 has been disclaimed.

[21] Appl. No.: 112,680

[22] Filed: Oct. 23, 1987

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 829,160, Dec. 14, 1985, Pat. No. 4,702,190, and Ser. No. 791,774, Oct. 25, 1985, abandoned, said Ser. No. 829,160, is a continuation-in-part of Ser. No. 725,268, Apr. 11, 1985, Pat. No. 4,624,203, which is a continuation-in-part of Ser. No. 681,933, Dec. 14, 1984, Pat. No. 4,595,636.

[30] **Foreign Application Priority Data**

Jul. 9, 1985	[DK]	Denmark	3126/85
Jul. 9, 1985	[IE]	Ireland	1728/85
Jul. 10, 1985	[CA]	Canada	486,604
Jul. 11, 1985	[AU]	Australia	554430/85
Jul. 12, 1985	[NZ]	New Zealand	212732
Jul. 17, 1985	[ZA]	South Africa	85/5412
Jul. 22, 1985	[IT]	Italy	67465 A/85
Jul. 23, 1985	[ES]	Spain	545448
Jul. 23, 1985	[EP]	European Pat. Off.	85305249.6
Jul. 24, 1985	[FR]	France	85 11311
Dec. 13, 1985	[JP]	Japan	60-281066
Nov. 20, 1986	[AU]	Australia	65543/86

[51] Int. Cl.[4] B63H 9/06

[52] U.S. Cl. 114/103

[58] Field of Search 114/39.1, 102, 103, 114/108, 109, 113, 114, 115

[56] **References Cited**

U.S. PATENT DOCUMENTS

2,795,038	6/1957	Pepi et al.	114/103
3,274,968	9/1966	Hayn et al.	114/103
3,356,059	12/1967	Ross	114/103
3,825,711	8/1974	Russell	114/103
3,934,076	5/1976	Frazier	114/103
4,595,636	6/1986	Conrad	114/103

Primary Examiner—Sherman D. Basinger

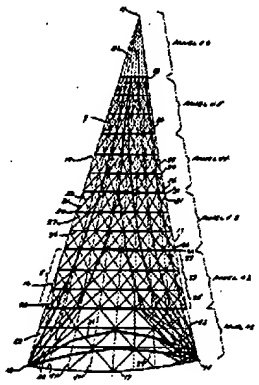
Assistant Examiner—Jesus D. Sotelo

Attorney, Agent, or Firm—Fred A. Keire

[57] **ABSTRACT**

A sail wherein the loads thereon in use are carried predominantly by structural members properly disposed within the sail.

9 Claims, 3 Drawing Sheets



FAST Browser - 13 (14) 5 and 8 and 3 | US 4708080 A | Tag S_TI | Doc: 13/14 | Format: KWIC

File Edit View Tools Window Help

	Document ID	Title
12	US 4831953 A	Structural sails
13	US 4708080 A	Composite thread line sails
14	US 4593639 A	Method of stress distribution i

US-PAT-NO: 4708080

DOCUMENT-IDENTIFIER: US 4708080 A

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Times New Roman 12

TITLE: Composite thread line sails

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Detailed Description Text - DETX (8):

However, the winding operation now is on a frame, one corner of which serves as the focal point for all of the threads 7 running in that direction. Since the point loads on a sail are found in the head, tack and clew (and at reef locations, i.e., reef points and reef tack and clew), panel 3 in FIG. 3 illustrates especially well the advantages gained with the present sail where the thread concentration is in the point load location, i.e., tack 12, and parallels and substantially follows the stress lines and load lines encountered in the sail and as previously discussed in my above-identified U.S. Pat. No. 4,593,639. For the reef point loads and stress lines associated therewith, reef point thread lines as additional threads may be laid on top of the thread layout for a full size sail, the associated reef point hardware, i.e., cringles, may be used, the same as for the full size sail, and will be further discussed herein.

Claims Text - CLTX (1):

1. A composite sail having a head, a tack and a clew, which in use and for an intended purpose has principal stress lines, said sail comprised of a plurality of panels, each of said panels joined to an adjacent panel therefor, each of said panels comprised of a laminate of at least two layers whereinbetween said layers nonwoven, force-bearing thread material is predeterminedly disposed along said principal stress lines for said panel in said sail.

United States Patent [19]

Conrad

[11] Patent Number: 4,708,080

[45] Date of Patent: Nov. 24, 1987

[54] COMPOSITE THREAD LINE SAILS

[75] Inventor: Peter G. Conrad, Old Lyme, Conn.

[73] Assignee: Sobstad Sailmakers, Inc., Old Saybrook, Conn.

[21] Appl. No.: 873,188

[22] Filed: Jun. 11, 1986

[51] Int. Cl.⁴ B63H 9/06

[52] U.S. Cl. 136/103; 114/113; 428/293; 428/294

[58] Field of Search 114/103, 102, 39, 108, 114/109, 113, 114, 115; 428/292, 293, 294, 295, 246, 284, 287, 253

[56] References Cited

U.S. PATENT DOCUMENTS

3,903,826	9/1975	Anderson	114/103
4,444,822	4/1984	Doyle et al.	428/253 X
4,476,799	10/1984	Brady	114/103
4,499,842	2/1985	Mahr	114/103
4,554,225	11/1985	Mahr	428/246 X
4,593,639	6/1986	Conrad	114/103
4,624,205	11/1986	Conrad	114/103

FOREIGN PATENT DOCUMENTS

126614	11/1984	European Pat. Off.	114/103
154772	9/1985	European Pat. Off.	114/103
2540439	8/1984	France	114/103

OTHER PUBLICATIONS

Bob Brimbridge, "Mylar Developments May Affect Sailcloth Technology", Industrial Fabric Products Review, vol. 59, 5/1982, pp. 61-63.

John Stansell, "The America's Cup-Grand Prix Yachting", New Scientis, No. 1562, 6/1983, pp. 770-775.

"Bonding Replaces Stitching on Racing Mainsails", Industrial Fabric Products Review, vol. 60, No. 11, 5/1984, p. 6.

Greg Peckman, "American Sail Market-Headed For Stormy Weather?", Industrial Fabric Products Review, vol. 62, No. 1, 5/1985, pp. 39-40.

Primary Examiner—Joseph F. Peters, Jr.

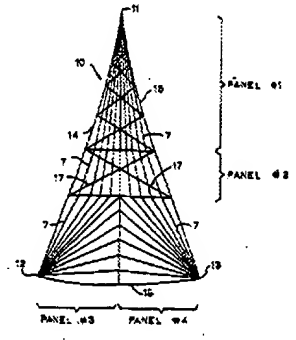
Assistant Examiner—Paul E. Salmon

Attorney, Agent, or Firm—Fred A. Kelre

[57] ABSTRACT

Sails made with threads running in the direction of principal stresses in a laminate made of the threads laminated to a film material, such as Mylar.

17 Claims, 15 Drawing Figures



DERWENT-ACC-NO: 2001-244528

DERWENT-WEEK: 200365

TITLE: Multisectional **sail body** used for creating sail, has reinforced material sectors arranged in overlapping pattern so that reinforcement elements are generally aligned with expected **load lines**

INVENTOR: BAUDET, J

PRIORITY-DATA: 1999US-0393132 (September 10, 1999)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
EP 1216188 B9	October 1, 2003	E	000	B63H 009/06
WO 200117848 A1	March 15, 2001	E	022	B63H 009/06
AU 200071293 A	April 10, 2001	N/A	000	B63H 009/06
US 6302044 B1	October 16, 2001	N/A	000	B63H 009/04
EP 1216188 A1	June 26, 2002	E	000	B63H 009/06
NZ 517004 A	September 27, 2002	N/A	000	B63H 009/06
EP 1216188 B1	April 23, 2003	E	000	B63H 009/06
AU 758796 B	March 27, 2003	N/A	000	B63H 009/06
DE 60002352 E	May 28, 2003	N/A	000	B63H 009/06

INT-CL (IPC): B63H009/04, B63H009/06

ABSTRACTED-PUB-NO: US 6302044B

BASIC-ABSTRACT:

NOVELTY - A sail section (46) includes a reinforced material laminated between films. The reinforced material has sectors individually provided with a set of parallel reinforcement elements. The sectors are arranged in an overlapping pattern so that the reinforcement elements are generally aligned with the expected **load lines**.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(a) a method for making a **sail body** from the sail sections;

(b) and a method for making a sail.

USE - Used for creating sail used for sailcraft, boats.

ADVANTAGE - Reduces manufacturing cost since the **sail body** is created from only 5 or 6 sail sections. Enables creation of a lightweight, flexible, three-dimensional air foil that maintains its desired aerodynamic shape through a chosen wind range. Prevents undesired drag as well as excessive heeling of the boat. Prevents waste of precious wind energy.

DESCRIPTION OF DRAWING(S) - The figure shows the plan view of the sail made from the **sail bodies**.

Sail section 46

ABSTRACTED-PUB-NO: WO 200117848A

EQUIVALENT-ABSTRACTS:

NOVELTY - A sail section (46) includes a reinforced material laminated between films. The reinforced material has sectors individually provided with a set of parallel reinforcement elements. The sectors are arranged in an overlapping pattern so that the reinforcement elements are generally aligned with the expected **load lines**.

DETAILED DESCRIPTION - INDEPENDENT CLAIMS are also included for the following:

(a) a method for making a **sail body** from the sail sections;

(b) and a method for making a sail.

USE - Used for creating sail used for sailcraft, boats.

ADVANTAGE - Reduces manufacturing cost since the **sail body** is created from only 5 or 6 sail sections. Enables creation of a lightweight, flexible, three-dimensional air foil that maintains its desired aerodynamic shape through

a chosen wind range. Prevents undesired drag as well as excessive heeling of the boat. Prevents waste of precious wind energy.

DESCRIPTION OF DRAWING(S) - The figure shows the plan view of the sail made from the **sail bodies**.

Sail section 46

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Basic Abstract Text - ABTX (1):
NOVELTY - A sail section (46) includes a reinforced material laminated between films. The reinforced material has sectors individually provided with a set of parallel reinforcement elements. The sectors are arranged in an overlapping pattern so that the reinforcement elements are generally aligned with the expected **load lines**.

Basic Abstract Text - ABTX (3):
(a) a method for making a **sail body** from the sail sections;

Basic Abstract Text - ABTX (6):
ADVANTAGE - Reduces manufacturing cost since the **sail body** is created from only 5 or 6 sail sections. Enables creation of a lightweight, flexible, three-dimensional air foil that maintains its desired aerodynamic shape through a chosen wind range. Prevents undesired drag as well as excessive heeling of the boat. Prevents waste of precious wind energy.

Basic Abstract Text - ABTX (7):
DESCRIPTION OF DRAWING(S) - The figure shows the plan view of the sail made from the **sail bodies**.

Title - TIX (1):
Multisectional **sail body** used for creating sail, has reinforced material sectors arranged in overlapping pattern so that reinforcement elements are generally aligned with expected **load lines**

Equivalent Abstract Text - ABEQ (1):
NOVELTY - A sail section (46) includes a reinforced material laminated between films. The reinforced material has sectors individually provided with a set of parallel reinforcement elements. The sectors are arranged in an overlapping pattern so that the reinforcement elements are generally aligned with the expected **load lines**.

Equivalent Abstract Text - ABEQ (3):
(a) a method for making a **sail body** from the sail sections;

Equivalent Abstract Text - ABEQ (6):
ADVANTAGE - Reduces manufacturing cost since the **sail body** is created from only 5 or 6 sail sections. Enables creation of a lightweight, flexible, three-dimensional air foil that maintains its desired aerodynamic shape through a chosen wind range. Prevents undesired drag as well as excessive heeling of the boat. Prevents waste of precious wind energy.

Equivalent Abstract Text - ABEQ (7):
DESCRIPTION OF DRAWING(S) - The figure shows the plan view of the sail made from the **sail bodies**.

Standard Title Terms - TTX (1):
MULTISECTION **SAIL BODY** SAIL REINFORCED MATERIAL SECTOR ARRANGE OVERLAP
PATTERN SO REINFORCED ELEMENT GENERAL ALIGN **LOAD LINE**

DERWENT-ACC-NO: 2000-564863

DERWENT-WEEK: 200365

TITLE: **Sail body** and method for making

INVENTOR: BAUDET, J

PRIORITY-DATA: 1999US-0340276 (June 25, 1999)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
NZ 516378 A	August 29, 2003	N/A	000	B63H 009/06
US 6112689 A	September 5, 2000	N/A	010	B63H 009/04
WO 200100487 A1	January 4, 2001	E	000	B63H 009/06
AU 200046931 A	January 31, 2001	N/A	000	B63H 009/06
EP 1206380 A1	May 22, 2002	E	000	B63H 009/06
JP 2003503262 W	January 28, 2003	N/A	031	B63H 009/06
AU 761740 B	June 12, 2003	N/A	000	B63H 009/06

INT-CL (IPC): B63H009/04, B63H009/06 , D03D001/00 , D03D009/00 , D03D015/00

ABSTRACTED-PUB-NO: US 6112689A

BASIC-ABSTRACT:

NOVELTY - A **sail body** (3) includes first and second skin layers (40,42), each skin layer having an outer film (22) at an outer side (34) and reinforcement elements (28,30) at an inner side (36). The skin layers are laminated with the inner skins abutting to form the **sail body**. The skin layers are each made up of skin components (38) joined to other skin components of the same skin layer another along their aligned edges (43). The joined edges (44) of the first skin layer are offset from the joined edges of the second skin layer to strengthen the **sail body**. The **sail body** is preferably a three-dimensional molded **sail body**. The fibers or other reinforcement elements are preferable

generally aligned with the expected **load lines** (32) of the **sail body**.

USE - **Sail body** and method for making.

DESCRIPTION OF DRAWING(S) - A plan view of a sail.

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Basic Abstract Text - ABTX (1):
NOVELTY - A **sail body** (3) includes first and second skin layers (40,42), each skin layer having an outer film (22) at an outer side (34) and reinforcement elements (28,30) at an inner side (36). The skin layers are laminated with the inner skins abutting to form the **sail body**. The skin layers are each made up of skin components (38) joined to other skin components of the same skin layer another along their aligned edges (43). The joined edges (44) of the first skin layer are offset from the joined edges of the second skin layer to strengthen the **sail body**. The **sail body** is preferably a three-dimensional molded **sail body**. The fibers or other reinforcement elements are preferable generally aligned with the expected **load lines** (32) of the **sail body**.

Basic Abstract Text - ABTX (2):
USE - **Sail body** and method for making.

Title - TIX (1):
Sail body and method for making

Standard Title Terms - TTX (1):
SAIL BODY METHOD

DERWENT-ACC-NO: 1992-122821

DERWENT-WEEK: 199215

TITLE: Laminated reinforced composite **sailcloth** - has weft-free, stretch resistant polymer strands between outer layer and inner layer composed of resin and polymer strand panels

INVENTOR: LINVILLE, J C

PRIORITY-DATA: 1990US-0525758 (May 18, 1990) , 1988US-0258868 (October 17, 1988)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
US 5097783 A	March 24, 1992	N/A	011	N/A

INT-CL (IPC): B63H009/06

ABSTRACTED-PUB-NO: US 5097783A

BASIC-ABSTRACT:

Composite sail is made from a number of joined panels, each made from a laminate comprising a layer of weft-free warp of strands of stretch resistant polymer (28) between an outer layer (26) and an inner layer (22) made from a number of abutting panel segments (24) of reinforced material. Each segment comprises at least one layer of a dimensionally stable resin film and at least one layer of strands of stretch resistant polymer aligned along the principal **stress lines** of the segment in the sail. The layers are bonded by a synthetic adhesive resin. Pref. the denier density of the inner layer strands varies to as to be lower at the luff end and higher at the leech end. The strands are pref. of aramid and the outer layer of polyester resin.

ADVANTAGE - Improved resistance to stretch and deformation in the max. stress

directions.

---------- KWIC ---------

Basic Abstract Text - ABTX (1):

Composite sail is made from a number of joined panels, each made from a laminate comprising a layer of weft-free warp of strands of stretch resistant polymer (28) between an outer layer (26) and an inner layer (22) made from a number of abutting panel segments (24) of reinforced material. Each segment comprises at least one layer of a dimensionally stable resin film and at least one layer of strands of stretch resistant polymer aligned along the principal **stress lines** of the segment in the sail. The layers are bonded by a synthetic adhesive resin. Pref. the denier density of the inner layer strands varies to as to be lower at the luff end and higher at the leech end. The strands are pref. of aramid and the outer layer of polyester resin.

Title - TIX (1):

Laminated reinforced composite **sailcloth** - has weft-free, stretch resistant polymer strands between outer layer and inner layer composed of resin and polymer strand panels

Standard Title Terms - TTX (1):

LAMINATE REINFORCED COMPOSITE **SAILCLOTH** WEFT FREE STRETCH RESISTANCE
POLYMER STRAND OUTER LAYER INNER LAYER COMPOSE RESIN
POLYMER STRAND PANEL

DERWENT-ACC-NO: 1992-089805

DERWENT-WEEK: 200010

TITLE: Sail of three=dimensional laminated moulded fabric - has yarns disposed along and across expected **load lines**

INVENTOR: BAUDET, J; BAUDET, J P

PRIORITY-DATA: 1990US-0570402 (August 21, 1990)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE	PAGES	MAIN-IPC
EP 475083 A	March 18, 1992	N/A	011	N/A
CA 2049657 C	October 26, 1999	E	000	B63H 009/06
US 5097784 A	March 24, 1992	N/A	011	N/A
AU 9182508 A	February 27, 1992	N/A	000	N/A
CA 2049657 A	February 22, 1992	N/A	000	N/A
AU 638599 B	July 1, 1993	N/A	000	B63H 009/06
NZ 239217 A	December 22, 1994	N/A	000	B63H 009/06
EP 475083 B1	November 15, 1995	E	015	B63H 009/06
DE 69114629 E	December 21, 1995	N/A	000	B63H 009/06
ES 2080866 T3	February 16, 1996	N/A	000	B63H 009/06

INT-CL (IPC): B29C055/48, B29C065/48 , B32B001/10 , B32B005/02 , B32B027/12 , B63H009/06

ABSTRACTED-PUB-NO: EP 475083A

BASIC-ABSTRACT:

Sail of one piece three dimensional laminated fabric with uninterrupted load bearing yarns includes moulding a pliant three dimensional laminate having an outer base or structural film layer (8) of suitable sail material e.g. polyester Mylar film, polyethylene film, polypropylene film etc., a structural layer of load bearing yarns (6) e.g. of polyester, aramid, polyolefin, carbon,

polyamide fibre etc. disposed over the film layer both along and across the predicted lines of stress in the sail and an outer protective (4) covering the yarn layer.

ADVANTAGE - Provides ideal shape without irregularities.

ABSTRACTED-PUB-NO: EP 475083B

EQUIVALENT-ABSTRACTS:

A **sail having a body** extending between the edges thereof, said sail comprising a three dimensional, one piece laminate, said one piece laminate comprising an impervious layer of sheet material and a layer comprising load carrying yarns, said load carrying yarns extending continuously and uninterruptedly between the edges of the sail said yarns being laid along the convex surface of the **sail in said laminate** and carrying the majority of loads in the sail.

US 5097784A

The **sail has a body** extending between the edges and comprises a three dimensional, one piece laminate, laminate having an outer impervious layer of sheet material and an inner layer comprising load carrying yarns. The load carrying yarns are pretensioned and extend continuously and uninterruptedly between the edges of the sail, the yarns are laid in a three dimensional fashion in the laminate and carrying the majority of loads in the sail.

The sail comprises a pair of outer layers sheet material, and the inner layer is disposed between the outer layers. The inner layer additionally comprises secondary yarns extending at angles to the load carrying yarns.

---------- KWIC ---------

Title - TIX (1):
Sail of three=dimensional laminated moulded fabric - has yarns disposed along and across expected **load lines**

Equivalent Abstract Text - ABEQ (1):
A **sail having a body** extending between the edges thereof, said sail comprising a three dimensional, one piece laminate, said one piece laminate comprising an impervious layer of sheet material and a layer comprising load

carrying yarns, said load carrying yarns extending continuously and uninterruptedly between the edges of the sail said yarns being laid along the convex surface of the **sail in said laminate** and carrying the majority of loads in the sail.

Equivalent Abstract Text - ABEQ (2):

The **sail has a body** extending between the edges and comprises a three dimensional, one piece laminate, laminate having an outer impervious layer of sheet material and an inner layer comprising load carrying yarns. The load carrying yarns are pretensioned and extend continuously and uninterruptedly between the edges of the sail, the yarns are laid in a three dimensional fashion in the laminate and carrying the majority of loads in the sail.

Standard Title Terms - TTX (1):

SAIL THREE=DIMENSIONAL LAMINATE MOULD FABRIC YARN DISPOSABLE **LOAD LINE**